

## REMARKS

Applicant appreciates the time and courtesy of Examiner Trinh in conducting the telephone interview for this application on August 12, 2003.

Entry of the above amendments is respectfully requested. Claims 1-6, 10-14, 16-23, 25-28, 53-58, and 62-80 were originally pending. Claims 1, 14, 16, 21, 53, and 66 have been amended. Claims 10 and 20 have been cancelled. Claims 1-6, 11-14, 16-19, 21-23, 25-28, 53-58, and 62-80 are now pending in the application. Favorable reconsideration and allowance of this application is respectfully requested in light of the foregoing amendments and the remarks which follow.

### I. Claim Rejections - 35 USC § 112

Claims 1-6, 10-14, and 53-58 are now rejected under 35 USC 112, first paragraph, because the specification is said to not enable the recited method of forming the internal void. Applicant respectfully disagrees with the Examiner that it is “essential and necessary” to remove a portion of layer 31 (of the wafer) shown in Fig. 4 so that the internal void can be formed, as stated in the Office Action. Rather, the specification presents alternatives to the method illustrated in Fig. 4. For example, Fig. 18 and the accompanying description enables forming a void using a recess that is disposed in the upper surface of the *substrate*, rather than layer 31 of the *wafer*. It should, however, be appreciated that the claim term “substrate” is intended to include a wafer or wafer layer, as is understood by those having ordinary skill in the art.

Claims 1 and 53 have therefore been amended to clarify that removal of a portion of layer 31 is neither essential nor necessary. Rather, a recess can be disposed in either the claimed wafer or in the substrate in order to form the claimed internal void when the wafer is attached to the substrate. As discussed above, the specification enables the formation of an internal void when the wafer is attached to the substrate, whether the void is formed from a recess in the wafer, or whether the void is formed from a recess in the substrate.

Withdrawal of the rejection of claims 1-6, 10-14, and 53-59 is therefore respectfully requested.

## **II. Claim Rejections - 35 USC § 102**

### **A. The Greywall Reference**

Paragraph 4 of the Office Action rejects claims 1, 16, 19, 25, and 28 under 35 USC 102(e) as being anticipated by Greywall.

Applicant believes that a brief description of Greywall will assist the Examiner during reconsideration of the pending claims. Greywall teaches a method for fabricating an optical cavity having two mirrors, at least one of which is movable. These structures are achieved by patterning and attaching two SOI wafers. (See Abstract). During operation, a voltage is applied across one mirror, which causes an electrostatic force biasing the movable mirror selectively towards and away from the stationary mirror (See Col. 5, lines 30-33).

Claim 1 has been amended to recite limitations previously recited in claim 10 (now cancelled). Namely, claim 1 now recites that the first layer comprises an insulating material. Claim 1 further recites that the bridge is formed from the first layer (i.e., of the insulating material). As the Office Action correctly points out, Greywall does not disclose that the bridge is made of an insulator. Furthermore, Greywall teaches away from the bridge comprising an insulator because, if Greywall's stationary bridge were insulating, it would not create an electrostatic force in response to a voltage. Likewise, if Greywall's movable bridge were insulating, it would not move in response to the induced electrostatic force. Presumably for at least this reason, previous claim 10 was not rejected in view of Greywall. Accordingly, claim 1 and all corresponding dependent claims are patentable over Greywall.

Likewise, independent claim 16 has been amended to recite that the first layer is insulating, and that the bridge member is formed from the first layer. Dependent claim 20 has been cancelled. For the reasons stated above with reference to claim 1, Applicant asserts that claim 16 and all corresponding dependent claims are allowable in view of Greywall.

Withdrawal of the rejection of claims 1, 16, 19, 25, and 28 under 35 USC 102 in view of Greywall is respectfully requested.

### **B. The Black Reference**

Paragraph 5 of the Office Action rejects claims 1-6, 10-14, 16, 19-21, 23, 25-28, 53-58, 62-63, 66-68, 71-73, and 75-80 under 35 USC 102 as being anticipated by Black.

Applicant believes that a brief description of Black will assist the Examiner during reconsideration of the pending claims. Black teaches a method for fabricating a pressure sensor (See Abstract). In particular, a first wafer 20 is provided and patterned to create a plurality of resistor arrays 28 supported by a layer 30 of silicon dioxide (See Fig. 2; Col. 3, lines 15-20). A second wafer 40 is also provided and patterned (See Fig. 7). First wafer 20 is then turned upside down and attached to wafer 40 (See Fig. 8) to form a composite structure. The composite structure is then attached to a molybdenum shim stock 50 (Fig. 9) to produce the pressure sensors illustrated in Fig. 10. Notably, layer 30 extends between aluminum bonding pads 32, and is not released from the wafer 20. Moreover, Black does not enable the release of layer 30 because layer 30 is protected by layers 51 and 23.

1. Claims 1-6 and 10-14

The Office Action cites Black as teaching the step of etching through the upper layer around the periphery of bridge member 30 to break through the recess, thereby releasing the bridge from mechanical communication with the substrate. Applicant has reviewed Black, however, and can not find such a teaching. Rather, as illustrated in Fig. 9, layer 30 spans between bonding pads 32 and supports resistor arrays 28. Black does not disclose etching through layer 30 when describing Fig. 10 as alleged in the Office Action. Rather, Black merely discloses etching downwardly to expose the bonding pads 32 (See Col. 6, lines 17-28). Additionally, as discussed above, Black can not enable the release of layer 30 because layer 30 is protected by layers 51 and 23. An etchant would thus not be able to access layer 30 to form a bridge without removing other layers on the wafer.

Black therefore fails to teach or suggest several elements recited in claim 1 as amended. First, Black fails to teach or suggest the step of removing a portion of the first layer through to the second layer to form a bridge member from the first layer. Additionally, Black fails to teach or suggest etching through the second layer of the wafer around the periphery of the bridge member to break through into the void, thereby releasing the bridge from the substrate.

Applicant therefore asserts that claim 1 and corresponding dependent claims 1-6 and 11-14 are allowable over Black.

2. Claims 16, 19-21, 23, and 25-28

Claim 16 also recites steps that are not taught or suggested by Black. In particular, claim 16 recites removing a portion of the first member through to the second member to form a bridge. Claim 16 further recites the step of etching through the second member around the periphery of the bridge to break through into the recess and release the second member from mechanical communication with the substrate. As discussed above with reference to Fig. 1, Black fails to teach or suggest at least these claim limitations.

Applicant therefore asserts that claim 16 and corresponding dependent claims 19-21, 23, and 25-28 are allowable over Black.

### 3. Claims 53-58, 62-63, and 66-67

Claim 53 recites a method of fabricating a MEMS structure. The etching step releases the bridge from the substrate, forms a conductive member extending from the bridge, and forms a stationary member from the wafer that is separated from the bridge member by a gap that varies in size in response to bridge member movement. As discussed in the telephone interview, none of the prior art references teach or suggest this element. In particular, Black does not teach the release of a bridge member from the substrate, as discussed above. Black further fails to teach that the etching step forms a stationary member that is separated from the bridge member by a gap that varies in size in response to bridge member movement. Rather, the closest element in Black to a bridge (resistive array 18) is supported by layer 30 which is fixed to wafer 20. Accordingly bridge is prevented from moving to vary the size of a gap, as recited in claim 53. Greywall also fails to teach or suggest this claim limitation, as the stationary member in Greywall is a mirror on the opposing wafer, as opposed to the wafer recited in claim 53.

Applicant therefore asserts that claim 53 and corresponding dependent claims 54-58, 62-63, and 66-67 are allowable over the prior art.

### 4. Claims 68, 71-73, and 75-80

Claim 68 also recites a method of fabricating a MEMS structure. The recited etching step releases the bridge from mechanical communication with the substrate, and forms a conductive member extending from the bridge and separated from a stationary member via a gap that varies in size in response to bridge movement. As discussed above with reference to claim 53, Black fails to disclose the variable sized gap recited in claim

68. Greywall's bridge comprises only a single member, namely the mirror. Accordingly, Greywall fails to disclose a conductive member extending from the bridge.

Applicant therefore asserts that claim 68 and corresponding dependent claims 71-73 and 75-80 are allowable over the prior art.

### **III. Claim Rejections – 35 USC §103**

#### **A. Paragraph 7 of the Office Action**

Paragraph 7 of the Office Action rejects claims 4-6 and 28 as being unpatentable over Greywall in view of Coldren. Applicant asserts the patentability of corresponding independent claims 1 and 16 as sufficient basis for the allowability of claims 4-6 and 28. Withdrawal of the rejection of claims 4-6 and 28 is therefore respectfully requested.

#### **B. Paragraph 8 of the Office Action**

Paragraph 8 of the Office Action rejects claims 2-3 and 26-27 as being unpatentable over Greywall in view of Jacobsen. Applicant asserts the patentability of corresponding independent claims 1 and 16 as sufficient basis for the allowability of claims 2-3 and 26-27. Withdrawal of the rejection of claims 2-3 and 26-27 is therefore respectfully requested.

#### **C. Paragraph 9 of the Office Action**

Paragraph 9 of the Office Action rejects claims 10, 11, and 20-22 as being unpatentable over Greywall in view of Huibers. Claims 10 and 20 have been cancelled by way of this Amendment. Applicant asserts the patentability of independent claims 1 and 16 as sufficient basis for the allowability of claims 11 and 21-22. Withdrawal of the rejection of claims 11 and 21-22 is therefore respectfully requested.

#### **D. Paragraph 10 of the Office Action**

Paragraph 10 of the Office Action rejects claims 12-13 and 17-18 as being unpatentable over Greywall in view of McNie. Applicant asserts the patentability of independent claims 1 and 16 as sufficient basis for the allowability of claims 12-13 and 17-18. Withdrawal of the rejection of claims 12-13 and 17-18 is therefore respectfully requested.

#### **E. Paragraph 11 of the Office Action**

Paragraph 11 of the Office Action rejects claims 12-13, 15, 17-18, 22, 64-65, 69-70, and 74 as being unpatentable over Black in view of McNie. Applicant asserts the patentability of independent claims 1, 16, 53, and 68 as sufficient basis for the allowability of these claims. Withdrawal of the rejection of claims 12-13, 15, 17-18, 22, 64-65, 69-70, and 74 is respectfully requested.

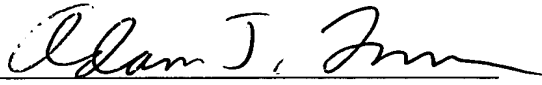
**V. Conclusion**

Applicant therefore asserts that all rejections and objections cited by the Examiner have been overcome. Accordingly, the application is in condition for allowance, and a Notice of Allowance is earnestly solicited. The Examiner is invited to contact the undersigned at the telephone number appearing below if such would advance the prosecution of this application.

The Commissioner is hereby authorized to deduct the \$110 fee for a one month extension of time, along with any additional fees deemed necessary, from Deposit Account No. 17-0055.

Respectfully submitted,

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